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P2.1097 Correction of turbulent flow moments measured by Langmuir probes in the vicinity of the L-H transition in COMPASS

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The analysis of turbulent flows in the edge region of tokamak plasmas requires the measurement of time-averaged turbulent stresses and fluxes such as the Reynolds stress (RS), which has been identified in recent models and experiments [1] as a likely driver of poloidal zonal flows expected to play a key role in the L-H transition. However, the common method of using floating potential fluctuations measured by Langmuir probes (LP) V^(LP)*(fl) suffers from being contaminated by electron temperature fluctuations T_e[2, 3]. For the interpretation of such experiments it is worth-while to seek a correction of V^(LP)*(fl) statistics by the exploitation of additional knowledge of T_e statistics offered by e.g. the combination of LP with ball-pen probes (BPP) [4]. A proof-of-principle correction scheme for the RS measured by LP was found for experimental data measured in the COMPASS tokamak with the modified Reynolds stress probe head [5]. The correction scheme is based on the decomposition of RS into statistical moments such as variance and poloidal and radial covariances of V^(LP)_(fl) measured by LP with statistical moments of T_e from BPP measurements. The correction scheme was further compared with the relationships between the associated statistical moments in comparable turbulent HESEL [6] simulations.
The correction scheme was further tested for the time-evolving phenomena of Limit Cycle Oscillations (LCO) observed in the vicinity of the L-H transition in the COMPASS tokamak [5]. The LCO typically have a frequency of 3-5 kHz. Their frequency is observed to scale inversely with the plasma density as well as with other global parameters.

References

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